



High-priority product: Electrocardiography Monitoring System

Designation of multi-material multi-functional product:	Electrocardiography (ECG) monitoring system
General description of product (3 – 4 sentences):	Implantable measurement devices are used for long term diagnostic purposes in humans for example to measure the electrical activity of the heart by electrocardiography. As the outer dimensions of the implant vary according to the patient's body measurements (from children to athletics) different size classes have to be defined (product sub-divisions). In certain cases, especially patients with a pre-disease, further individualization appears quite meaningful (uniquely personalized).
Multi-materials needed/required:	Biocompatibility is essential for the functionality of the monitoring system. Therefore, a promising material would be alumina ceramic which should be integrated with conductors functioning as electrodes, direct communication contacts (USB), and antennas. Electrodes and direct communication contacts penetrating through the walls of the housing (absolutely tight joints necessary) could be made preferably from a conducting mixture of alumina and titanium nitride. Antennas will be metallic and can consist of a layer on the inside or even integrated into the housing.
Multi-functionality needed/required:	The monitoring system has to accomplish multiple functions: The device needs to measure the differential electric signals with a conductor (electrodes) and to communicate with external device/s through a wireless link. Last not least all components of the system have to be reduced in size as far as possibly to minimize influence on patient's condition.
Expected improvement:	<p><u>Technical progress:</u> 2C-CIM will enable the processing of conductive ceramics and absolutely tight (co-sintered) interfaces. A unique combination of ceramic additive manufacturing to enable customized products and CIM to secure low-cost standard components has to be developed Ceramic additive manufacturing will be enhanced towards smaller geometries ($\leq \pm 50\mu\text{m}$)</p> <p><u>Societal, economic progress:</u> Reduce visits to doctor's, which is important especially at times were the population in Europe is getting older and health costs are increasing. Improve better use of monitoring equipment at hospitals with such specialized instrument. Increases the wellbeing and security of patients, where such equipment can be used to fine adjust medicine, by analyzing the data from the equipment. Creates new jobs and secures jobs.</p>
Bottlenecks to overcome for reaching the expected improvement	Two-material housings to be made of 1) biocompatible ceramic incorporating sections of 2) conductive ceramics Guaranteeing absolutely tight joints



Advanced Manufacturing of Multi-Material Multi-Functional Products Towards 2020 and Beyond

	Development of combined manufacturing processes for individualized <u>and</u> miniaturized components => merger of additive manufacturing and micro injection moulding
Functional requirements:	<p>The project will enable to manufacture custom made parts for personalised products at the cost level of mass products and with reduced lead-time (thanks to use of additive manufacturing and avoiding machining) compared to the today process of mechanical machining.</p> <p>The symbiosis of processes will be concretized by the adjustment of the debinding and sintering procedures of the materials, leading to the possibility of assembling very dissimilar materials (like e.g. insulating and conductive ceramics, and metals).</p>
Technical sketch of product (if applicable):	N/A

2020